CORE

The Voice of Mineral Exploration/Winter 2014

HOW MINERALS MAKE OUR LIVES POSSIBLE

PDAC 2014 CONVENTION NEWS AND UPDATES

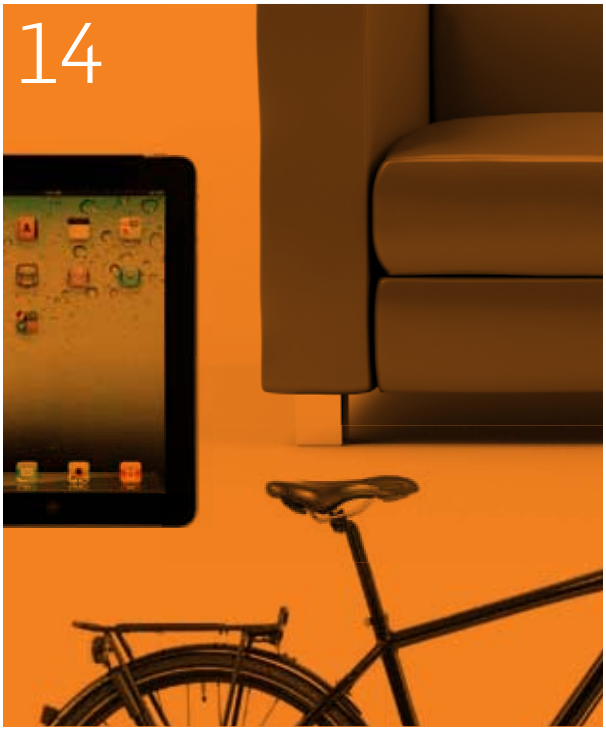
FROM BALLET TO MINING: ONE WOMAN'S EXTRAORDINARY JOURNEY

Award Winners: Celebrating our best

PDAC
PROSPECTORS & DEVELOPERS ASSOCIATION OF CANADA

CORE

The Voice of Mineral Exploration
Winter 2014



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INDUSTRYNEWS

National Research Council of Canada Creates a High Efficiency Mining Program

The National Research Council of Canada announced a new High Efficiency Mining program in November designed to improve cost-effective technical solutions in the mining sector.

Improving supply chains, equipment durability, and optimizing the mining process through new technologies, the program will provide cost-saving measures and efficiencies at every stage of mining to keep Canadian mines competitive.

These innovative technologies will allow companies to mine remote resources and extend existing low grade ore operations more economically.

Government of the Northwest Territories Launches Mineral Development Strategy

The Government of the Northwest Territories (GNWT) has launched a Mineral Development Strategy. The strategy is a framework for creating a sustainable and responsible environment for mineral exploration and development, while building a strong economy in the territory. The Mineral Development Strategy is built to meet five key objectives:

- **Creating a competitive edge**
- **Establishing a new regulatory environment for the NWT**
- **Enhancing Aboriginal engagement and capacity**
- **Promoting sustainability**
- **Enriching workforce development and public awareness**

The GNWT is expected to release the implementation plan to the strategy in early 2014.

THE WORLD GOLD COUNCIL RELEASES RESPONSIBLE GOLD MINING REPORT

The World Gold Council released a new research report: *Responsible Gold Mining & Value Distribution*, in October. Analyzing 2012 data from 15 companies, the report assesses the value distribution made by gold mining companies in 28 countries around the world.

Examining the role these companies play in supporting sustainable socio-economic development in host nations, the report finds that from a total spend of **$60.4 billion**, **$38.2 billion** (63%) went to suppliers, while **$9 billion** (15%) went to wages.

An additional **$9.1 billion** (15%) was paid to governments in taxes and **$3.7 billion** in payments to providers of capital. Of that total spend, the study found that more than **$48.4 billion** (80%) was made in the country of operation.

THE GOVERNMENT OF CANADA EXTENDS GEO-MAPPING FOR ENERGY AND MINERALS (GEM) IN NORTHERN CANADA

The Government of Canada has extended funding for the GEM program by investing $100 million over the next seven years. GEM has spurred private sector investment in northern Canada, increased mineral discovery rates, and promoted economic growth in Canada.

Between 2008 and 2012, eight GEM mineral projects generated

$16.7
MILLION

in mineral exploration spending. The program is expected to stimulate over

$500
MILLION

in exploration expenditures, with eventual mineral discoveries potentially valued at

$12
BILLION

GEM supports mineral exploration in three key ways:

1. Allows companies to identify areas with favourable mineral potential;

2. Increases exploration efficiency by minimizing the duplication of efforts and directs exploration investment toward the most prospective ground;

3. Increases exploration effectiveness by providing the information required for informed, risk-based decision-making in a cost-effective manner.

THE SUPREME COURT OF CANADA RULES ON ROSS RIVER

The Supreme Court of Canada handed down a ruling in mid-September dismissing the Government of Yukon's appeal in a case involving mineral exploration and the duty to consult on the traditional territories of the Ross River Dena Council (RRDC).

In 2011 the Yukon Supreme Court ruled the government has a duty to consult with Aboriginal groups before the mineral exploration work begins. The Yukon government appealed to the Supreme Court of Canada for clarification. Under current territorial law, anyone can stake a claim in the territory and conduct a certain amount of work without reporting it, including clearing trees, building trails, digging up rock and using explosives.

The government is currently in consultation with the RRDC on the mineral claim.

THE GOVERNMENT OF CANADA ANNOUNCES THE GLOBAL MARKET ACTION PLAN

The Canadian Government recently announced its Global Market Action Plan (GMAP). Building on the government's Global Commerce Strategy, the plan was created to help guide Canada's economic growth. The GMAP is designed to better use trade policy tools to target foreign markets that matter to Canadian industry in an effort to generate new jobs and new opportunities for Canadian workers working at home and abroad.

The plan will benefit the mining sector by building the capacity of Trade Commissioners and prioritizing trade-related agreements such as Foreign Investment Promotion and Protection Agreements (FIPAs), which will help address risks for exploration and development companies operating abroad.

BILL C-15

BILL C-15 INTRODUCED IN CANADIAN PARLIAMENT

Just prior to the New Year, Bill C-15, an act to replace the Northwest Territories Act, was introduced in the House of Commons by the Honourable Bernard Valcourt, Minister of Aboriginal Affairs and Northern Development (AANDC).

The proposed bill would implement components of the Northwest Territories Lands and Resources Devolution Agreement, amend sections of the Mackenzie Valley Resource Management Act (MVRMA), in addition to transferring responsibility for managing land, water and resources from the federal to the territorial government.

PDAC 2014 AWARD WINNERS

BY KATHLEEN NAPIER

The PDAC Board of Directors is pleased to announce the following award winners for their outstanding contributions to the mineral exploration and mining industry.

The winners will receive their awards at the PDAC 2014 Convention on March 3 at the Fairmont Royal York (Canadian Room) in Toronto.

THAYER LINDSLEY AWARD

This award recognizes an individual or a team of explorationists credited with a recent significant mineral discovery anywhere in the world.

GOLDRUSH DISCOVERY TEAM, BARRICK GOLD CORPORATION

For the team's discovery of the 14.1 million ounce Goldrush deposit in Cortez District, Nevada, USA.

In September 2011, Barrick announced its Goldrush discovery in Cortez District, Nevada.

The deposit, located in the eastern portion of the Cortez mining district, 6 km southeast of Cortex Hills, potentially represents the largest Carlin-style discovery in Nevada since Cortez Hills was discovered over 10 years ago.

The Cortez District has had a long discovery history and is challenged by concealed mineralization. Using an integrated exploration program based on the understanding of the deposit model and local stratigraphy, the discovery team used improved geologic interpretations and exploration techniques to discover and delineate the concealed deposit.

The Goldrush deposit has the third highest grade and is one of just +10 million ounce gold discoveries since 2001. Through aggressive exploration, the initial resource discovered at Goldrush has grown from 3.5 million to 14.1 million ounces, and now has a strike length of +7 km. A scoping study of the site has recently been completed and a pre-feasibility study is underway while exploration work and technical studies continue. A number of development options are currently being considered, including open pit mining, underground mining, or a combination of both.

The 25-person Goldrush Discovery Team was led by Rob Krcmarov, Senior Vice President, Global Exploration (Toronto), François Robert, Vice President and Chief Geologist (Toronto), Ed Cope, Vice President, Exploration North America (Elko, Nevada), Kevin Creel (Chief Exploration Geologist), Mark Bradley (District Geologist) and Alejandro Ly (Project Geologist). The team's knowledge and expertise of Carlin deposits and Nevada geology was instrumental in the discovery of Goldrush.

BILL DENNIS AWARD

This award honours (a) person(s) who has/have accomplished one or more of the following: made a significant mineral discovery; made an important contribution to the prospecting and/or exploration industry. The award may also be used to recognize an important mineral discovery in Canada.

ROSS MCELROY, PRESIDENT AND CHIEF OPERATING OFFICER, FISSION URANIUM CORP.

For leading Fission's team of geologists in one of the most significant discoveries in the Athabasca Basin in recent years.

Patterson Lake South property is a high-grade, shallow-depth uranium discovery located on the southwestern margin of the Athabasca Basin in northern Saskatchewan. In 2011, a team of Fission geologists, led by Ross McElroy, discovered a large radioactive boulder field. The team used a new airborne surveying technology specifically designed for radioactive deposits to make the discovery.

A Radon survey of the site was completed, following the discovery, to assist the team in identifying drill targets. Drilling in 2012 and 2013 resulted in the discovery of high-grade, shallow, thick uranium intersections which quickly launched the Patterson Lake South property to the top of analysts' watch lists. Over the past 10 months the discovery has grown from a single hole to five mineralized zones on-trend along a strike length of 1.03km.

Under the leadership of Ross McElroy, Fission's uranium discovery has rejuvenated the entire exploration industry in the Athabasca Basin. Previously ignored by the uranium exploration sector, the western side of the Athabasca Basin now has multiple programs being launched by other uranium junior miners in the area.

Ross McElroy has over 30 years experience as a professional geologist. He has been instrumental in five of the last nine major discoveries in the Athabasca Basin, and has made two major discoveries in the past three years including Patterson Lake South, and Fission Energy's J-Zone discovery.

VIOLA R. MACMILLAN AWARD

This award, which is named in honour of the PDAC's longest serving President, is given to (a) person(s) who has/have demonstrated leadership in management and financing for the exploration and development of mineral resources.

CAPSTONE MINING CORP.

For demonstrating leadership and management in the successful development of the Minto and Cozamin copper mines and in its acquisition of Pinto Valley Copper Mine, as well as transforming it into an intermediate copper producer.

Capstone Mining Corp., a Canadian base metals mining company headquartered in Vancouver, purchased BHP Billiton's Pinto Valley copper mining operation in Arizona in April 2013.

The Pinto Valley mine is the company's third copper producing mine. Capstone Mining Corp. currently operates Minto Mine, an open pit copper-gold-silver mine in the Yukon, and Cozamin Mine, a copper-silver-zinc-lead underground mine in Zacatecas, Mexico. The annual production of both mines is approximately 85 million pounds of copper.

Located in the Globe-Miami mining district in Arizona, the Pinto Valley site is expected to produce 130 to 150 million pounds of copper in concentrate and approximately 10 million pounds of copper cathode annually, and by-product molybdenum and silver. The site's estimated cash cost, for the first five years of production, is approximately $1.80 per pound (net of by-product credits).

The Pinto Valley acquisition transformed Capstone Mining Corp. from a mid-tier to an intermediate copper producer. The company's annual copper production is projected to increase by more than 160%, from 85 M lbs Cu to 235 M lbs Cu, with the new Arizona mine.

The financing structure and purchase price of Pinto Valley allows Capstone Mining Corp. to maintain financial flexibility and retain $135 million cash, providing them the necessary financial resources to continue funding development projects and avoid shareholder dilution.

The purchase of Pinto Valley allows Capstone Mining Corp. to further diversify its assets into Arizona, one of the world's most favourable mining jurisdictions.

"The original *e3* program was an environmental toolkit that focused on environmental excellence and included a section on community engagement."

DISTINGUISHED SERVICE AWARD

This award recognizes an individual who has achieved one or more of the following: made a substantial contribution to mineral exploration and mining development over a number of years; given considerable time and effort to the PDAC; made outstanding contributions to the mineral industry in the field of finance, geology, geophysics, geochemistry research, or a related activity.

ROGER WALLIS

For his outstanding contribution and dedication to the PDAC over the past 47 years.

Dr. Roger Wallis joined the PDAC in 1967, and has been an active PDAC committee member since 1993. He was one of the original *e3* authors. The original *e3* program was an environmental toolkit that focused on environmental excellence and included a section on community engagement. It offered an orientation to the processes related to environmental excellence.

The original program was used as the cornerstone for today's *e3 Plus*. While *e3 Plus* has grown to include social responsibility, and health and safety toolkits, the original *e3* manual has been incorporated as the environmental stewardship component of the *Framework for Responsible Exploration*.

Serving on a variety of PDAC committees, including: Land Access/WMI (1993-2000); Environmental Excellence in Exploration (2000-09); Corporate Social Responsibility (2009-2012); Annual Convention Planning Committee (2000-2013); International Geological Congress 2020 Bid Committee (2010-2011), Dr. Wallis has remained a vocal advocate for the industry over the past 20 years.

Dr. Wallis has been a proponent of the PDAC taking a leadership role in becoming more proactive about industry issues, particularly around environmental and corporate responsibility issues. He has participated in various meetings and working groups, and drafted countless briefs, articles and reports to raise awareness of industry concerns and needs with governments, Canadian stakeholders and NGOs.

Dr. Wallis has been an integral member of the Convention Planning Committee. Serving on the committee for 13 years, Dr. Wallis has organized more than 12 Technical Sessions, chairing one or more sessions each year, and has been a technical presenter a number of times. A natural leader, Dr. Wallis has worked hard with the committee raising the convention standard year after year.

Throughout his career, Dr. Wallis has participated in various provincial and national industry associations, including: Geological Association of Canada; Canadian Institute of Mining; Canadian Geological Council; Canadian Geological Foundation; Ontario Ministry of Economic Development; Ontario Science and Industry Grant Council; Ontario Geological Research Fund Committee; Toronto Geological Discussion Group; and Industry Advisory Board to the Ontario Geological Survey.

Teck

ENVIRONMENTAL & SOCIAL RESPONSIBILITY AWARD

This award honours an individual or organization who/which has demonstrated outstanding initiative, leadership and/or accomplishment in protecting and preserving the natural environment and/or in establishing good community relations during an exploration program or operation of a mine.

TECK RESOURCES LIMITED

For its outstanding accomplishments and commitment to sustainability, environmental and social initiatives.

Teck is Canada's largest diversified mining company, with assets in Canada, the USA, Chile and Peru. The company has learned over its 100-year history that responsible mining and mineral development are fundamental to long-term success. Teck's approach to business is guided by its pursuit of sustainability.

In 2011, Teck developed a comprehensive sustainability strategy, focusing on long- and short-term goals set to achieve the company's vision for sustainability. The sustainability strategy supports six key areas that represent the biggest challenges and opportunities for the mining sector: community, people, water, biodiversity, energy, and materials stewardship.

Teck is committed to investing in environmental and social initiatives with communities and organizations that align with the company's business objectives and sustainability efforts both locally and globally. Dedicated to building value through partnerships, Teck aims to address local and global sustainability issues.

Teck's sustainability, environmental and social initiative achievements to date include:

- Implementing over 50 energy efficiency projects reducing over 200 terajoules in operations
- Contributing over $23 million to more than 1,000 charitable organizations
- Investing $19 million to purchase 7,150 hectares in British Columbia's Elk Valley and Flathead River Valley
- Donating $2 million to the Nature Conservatory of Canada to help conserve Lot 48 on Columbia Lake in southeastern British Columbia and investing $12.5 million to support the expansion of the Vancouver Aquarium
- National Partner of the Canada Games, beginning with the 2013 Games in Sherbrooke
- Partnering with the Canadian Olympic Committee to develop the Teck Coaching Series
- Investing $1 million to support the completion of the Trans Canada Trail
- Supporting the Royal BC Museum as the Lead Partner in Biodiversity
- Sponsoring the Earth Rangers School Outreach Program
- Donating $7.5 million to create the Norman B. Keevil Institute of Mining Engineering at UBC and $5 million towards the new UBC Earth Sciences building
- Named to the 2013 Dow Jones Sustainability World Index, four years running
- Top ranked Canadian company and top ranked mining company worldwide on Corporate Knights' 2013 Global 100 Most Sustainable Corporations
- Recognized as one of Sustainalytics' Top 50 Socially Responsible Corporations in Canada in 2013.

SKOOKUM JIM AWARD FOR ABORIGINAL ACHIEVEMENT

Recipients of this award will have demonstrated exceptional achievement and/or service in a Canadian Aboriginal-run service business for the Canadian mining industry or a Canadian Aboriginal exploration or mining company, or have made a significant individual contribution to the mining industry.

JIM MACLEOD, PRESIDENT J.A. MACLEOD EXPLORATION AND ENVIROCREE LTD.

For his strong leadership in the environmental impact of the mining sector and his work advocating for more education and training programs for Aboriginal youth within the industry.

Mr. James MacLeod, a Cree resident of Mistissini, Quebec, is well known and respected in the mineral industry throughout Canada as a mining exploration technologist. Mr. MacLeod is a pioneer in mineral exploration and environmental impact and from the beginning recognized the link between mining and environment, and the importance of managing the relationship.

Mr. MacLeod began his career in mineral exploration as a young man, and founded J.A. MacLeod Exploration in 1987. Focussing his energy, knowledge and expertise on mineral exploration, Mr. Macleod has demonstrated a passion for field work, and built a strong reputation. In 2009, he founded EnviroCree Ltd., an Aboriginal company specializing in environmental services. Both companies employ a local Aboriginal workforce, providing learning opportunities and training programs for Cree youth.

Mr. MacLeod is a strong advocate of education and advises youth to participate in all forms of training available to them. Over the years, he has given a number of courses in the mineral exploration domain, financially supported by the CHRD (Cree Human Resources Development). In the Spring of 2013, EnviroCree provided 9 Crees of Mistissini and Oujé-Bougoumou with the opportunity to participate in the Building Environmental Aboriginal Human Resources (BEAHR) Training Program, prepared by Eco-Canada.

Founder of the Mistissini Geological Resources Centre, Mr. MacLeod has worked closely with native communities as a consultant on projects and training in mining exploration. He also serves on the Board of Directors of Cree Mineral Exploration Board, and Canadian Aboriginal Minerals Association. **c**

Kathleen Napier is the PDAC's Coordinator, Public Relations & Media.

PDAC 2014 CONVENTION

PDAC 2014

All Attendees Must Register for a Badge

New for 2014! From investors to media, all convention attendees must register for a badge. You may pre-register or register onsite. Onsite badge pick-up and the registration desks are located at the Metro Toronto Convention Centre, South Building, Level 600. You will not be permitted beyond Level 600 security without a badge.

For registration passes and fees, visit: **www.pdac.ca/convention/attendee-information/registration**.

LUNCHEONS

Ned Goodman

Mineral Outlook Luncheon

MTCC, South Building, Room 718
Monday, March 3, 12 noon – 2:00 pm
Tickets: $70 each

PDAC welcomes Ned Goodman, President and Chief Executive Officer at Dundee Corporation. Mr. Goodman has made transformative and enduring contributions to Canada's minerals industry and capital markets as a company-builder, merchant banker and investment advisor during a dynamic career spanning almost half a century. Goodman will discuss: *Capital rebound: How, where and when will it come back?*

Glenn Nolan

Panel Luncheon

MTCC, South Building, Room 718
Tuesday, March 4, 12 noon – 2:00 pm
Tickets: $70 each

Join us for a sit-down lunch and panel discussion on *Advancing the Ring of Fire – What has to happen to move it forward?* This panel will examine the future of the region, its complexities and existing barriers to development. This panel will cover an array of topics including environmental assessment, infrastructure and Aboriginal partnerships.
Moderator: Glenn Nolan, PDAC President
Panelists: Josh Hjartarson, Vice President, Policy and Government Relations, Ontario Chamber of Commerce; Bob Rae, Chief Negotiator, Matawa Tribal Council.
A third panelist to be announced.

Student-Industry Networking Luncheon

MTCC, North Building, Rooms 105/106
Tuesday, March 4, 11:30 am – 1:30 pm

The flagship event of the student program, this reception-style buffet luncheon gives you the opportunity to make valuable connections with industry professionals and peers. The winner of the Mary-Claire Ward Geoscience Award will be announced, as well as the selected 2014 Student-Industry Mineral Exploration Workshop (S-IMEW) students. Don't miss this opportunity to put your networking skills to good use. There will be draws for $500 tuition top-up awards. Proof of student membership is required to obtain the award. Admission only with a Student All Access Pass or All Access Pass.

NEW! MOBILE CONVENTION WEBSITE

Planning your time and navigating the convention has never been easier. Use our new Mobile Convention Website to build your schedule and add it to your smartphone calendar. Search, find and save the exhibitors you'd like to visit. View floorplans, presentation times and consult with our PDAC Mobile Masters to customize your online program.

Access the new Mobile Convention Website using the FREE Wi-Fi service throughout the MTCC, South Building (excluding the exhibit halls).

TECHNICAL PROGRAM

The Technical Program at PDAC 2014 opens on Sunday, March 2, with three sessions: Commodities and Market Outlook, Current Developments in Financial Markets and Public Disclosure, and Maximizing Company Profits and Growth by Acquisition.

On Monday morning, March 3, a variety of sessions will take place, including the Keynote Session: Sharing Mineral Wealth, and on Geometallurgy: The Critical Link Between the Deposit and the Mill, Human Resource Opportunities and Challenges in Prospecting and Mining, and Working with BRIC Countries: Exploration, Operation and Investment. Sessions on Wealth in Weathered Rocks, Diamonds and Mineral Economics will be held in the afternoon following the Mineral Outlook Luncheon where Ned Goodman of Dundee Corporation will discuss *Capital rebound: How, where and when will it come back?*

Technical sessions on Tuesday morning, March 4, include Peruvian Porphyry Copper Belts and Deposits, along with Jackpot at 2200 Ma West Africa, while sessions on Abitibi Breaks, Geophysics and Zinc will be held in the afternoon following the Panel Luncheon.

Closing out the Technical Program on Wednesday morning will be South Africa: An anniversary, New Challenges and Opportunities, Alternative Financing Sources for Junior Resource Companies, as well as Specialty Metals and Industrial Minerals, and New Discoveries and Developments.

For more information on the PDAC 2014 Technical Program, visit: **www.pdac.ca/convention/program/technical-program**.

MONDAY, MARCH 3
AWARDS EVENING
Outstanding achievements are honoured at the prestigious annual PDAC Awards Evening, where individuals and organizations are acknowledged for their significant contributions to the Canadian mineral industry. This hallmark event begins with a hosted reception, followed by a delectable three-course dinner, fine wine and live jazz music. A specialty Coffee-and-Liqueur Networking Reception rounds out this memorable evening.
Engaging videos, showcasing the stories and underscoring the accomplishments of each award winner, highlight this special evening.
6:00 – 7:00 pm Reception
7:00 – 8:30 pm Dinner
8:30 – 9:45 pm Award Presentations
9:45 pm Coffee-and-Liqueur Networking Reception
Tickets: $110 each
(includes all taxes and gratuities)
Dress: Business Attire, Black Tie Optional
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Dinner Wine
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Fairmont Royal York, Canadian Room

SHORT COURSES

PDAC 2014 will have 13 Short Courses to choose from.

Pre-convention Short Courses held Friday through Sunday morning (February 28, March 1 and 2) cover such topics as Exploration geochemistry: Extracting Knowledge from Data, Health and Safety in Mineral Exploration, as well as Developing a Cash Flow: Best Practices for Converting a Mineral Resource into a Mineral Reserve. The always popular Investment Fundamentals full-day course will be available on Saturday and includes presenters from mining companies, consulting firms and the brokerage community.

Once the convention is up and running, there will be three Short Courses to choose from on Wednesday, March 5. A morning session on Mineral Disclosure Standards under NI 43-101 will be given by the Ontario Securities Commission, while Alternative Financing Strategies for Challenging Times and the ever popular DMEC Workshop Series will take place in the afternoon.

For more information on the Short Courses, visit: **www.pdac.ca/convention/program/short-courses**.

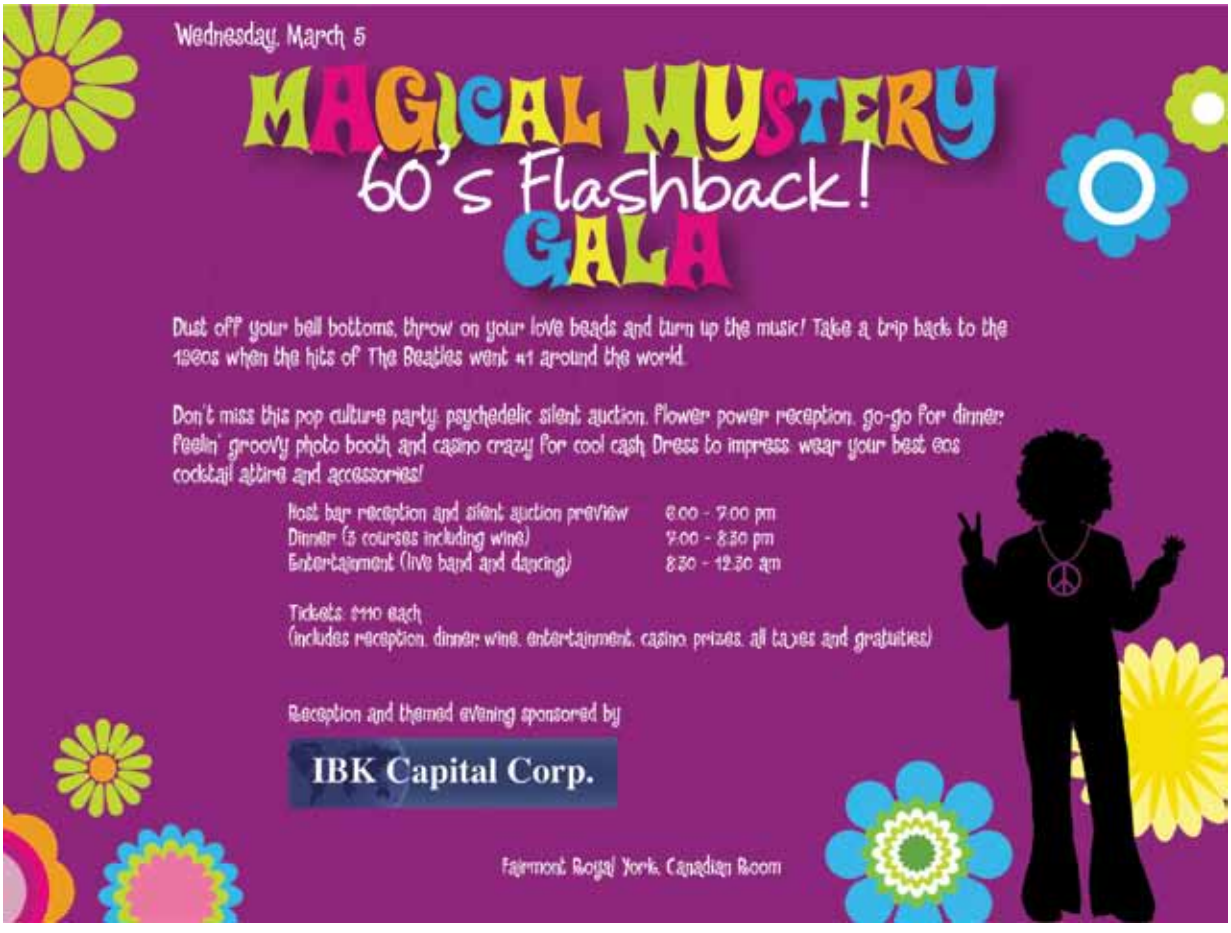
CONVENTION VIDEO – A GUIDED TOUR

Navigating your way through the convention has never been easier. Check out the PDAC 2014 Convention video that highlights what's new and what you will need to know to enhance your experience. Special thanks to FTI Consulting, the exclusive video sponsor and a first-time sponsor of the convention.

NEW MINING COUNTRY SPONSOR

For the first time ever a Mining Country sponsorship opportunity has been developed, and the PDAC is pleased to announce that Peru has become the first and exclusive Mining Country Sponsor of the PDAC 2014 Convention. **c**

Register and/or buy tickets for Short Courses, Luncheons and Evening Events (subject to availability) at **WWW.PDAC.CA/CONVENTION**.


Wednesday, March 5
MAGICAL MYSTERY
60's Flashback!
GALA
Dust off your bell bottoms, throw on your love beads and turn up the music! Take a trip back to the 1960s when the hits of The Beatles went #1 around the world.
Don't miss this pop culture party, psychedelic silent auction, flower power reception, go-go for dinner, Peelin' groovy photo booth and casino crazy for cool cash. Dress to impress, wear your best 60s cocktail attire and accessories!
Host bar reception and silent auction preview 6:00 - 7:00 pm
Dinner (3 courses including wine) 7:00 - 8:30 pm
Entertainment (live band and dancing) 8:30 - 12:30 am
Tickets: $110 each
(includes reception, dinner, wine, entertainment, casino prizes, all taxes and gratuities)
Reception and themed evening sponsored by
IBK Capital Corp.
Fairmont Royal York, Canadian Room

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Peter Bojtos
Sprott Inc.

MINING MAKES YOUR LIFE POSSIBLE

Whether it's your bicycle or cellphone, life as you know it would not exist without minerals

BY STEPHEN HUME

So, you're parking both the family car and the transit pass, biking to work instead and feeling a tad righteous about helping British Columbia wean itself from its dirty addiction to the mining industry and the minerals it extracts.

Say thanks to a coal miner for the privilege. And don't forget the hardrock miner. Not to mention the smelter crew and the roughneck yanking pipe on some frigid drill rig.

Oh, and say thanks to the trucker hauling canisters of molybdenum, titanium or tungsten concentrate or the geologist staking gold, silver or rare earths deposits.

Without them and the industries that employ them, you'd be walking, not biking.

Bicycles, unless you ride one you made yourself from bamboo, lashings of hemp and dried banana peels, is entirely manufactured from materials obtained by mining—steel processed by burning metallurgical coal, perhaps lightened by adding specialized metals like titanium; plastic and synthetic rubber obtained from petroleum products.

PETROLEUM DERIVATIVES

Helmet, petroleum derivatives; spiffy quick-dry cycling duds, petroleum derivatives; LED safety lights, metals and rare earths obtained by mining; water bottle, metals or petroleum derivatives. Even the road you're riding on is a product of mining, engineered to reduce friction so you roll more easily.

The building you work in, even if it's a wood frame structure, is full of metals and plastics in the form of steel framing and connectors, wiring, lighting, office equipment, insulation, surfacing, window frames, roofing, plumbing fixtures and so on.

Even the ceramic cup from which you drink your coffee while reading this contains the mineral zircon.

And if you get around to sending me a snarky email regarding my insensitivity to the environmental benefits of biking to work by drawing attention to this—pardon the pun—irony, you'll be using mined minerals to deliver the message.

Computer keyboard, petroleum-derived plastics; circuitry, rare earths and special metals; screws, frames and fasteners, steel, aluminum and other metals; flat screen display, metals and plastics; battery, metals and plastics; case, metals and plastics.

Want a more detailed list?

Your computer, tablet or smartphone contains iron, titanium, aluminum, copper, zinc, nickel, gold, silver, lithium, magnesium, mercury, yttrium, palladium, tin, cadmium, indium, lead, samarium, tantalum and, if you are still running an optical drive, gadolinium and dysprosium. The plastics are heat resistant with melting points above the boiling temperature for water and are comprised of acrylonitrile, butadiene, styrene and carbon.

The total greenhouse gas emissions associated with a MacBook: About 460 kilograms of carbon dioxide.

In fact, there's even a calculation for the carbon footprint of an email. A long and tiresome one amounts to about 50 grams of CO_2, which doesn't seem like much until you total them, and then the Internet turns out to have a carbon footprint of around 300 million tonnes a year. So keep it short.

If you want your criticism of these observations to be truly green, I recommend a stylus and beeswax tablets—they worked for the Roman army—or clay tablets like those on which we are still able to discern the grumpy note a Sumerian teacher sent home to parents complaining of a wayward boy's lack of attention in class.

Don't mail them, though. The postal service is heavily reliant on mined metals and petroleum-based plastics.

There is steel in the post boxes, delivery trucks, sorting equipment; petroleum-derived plastics in the postal carrier's shoe soles, clothes, bags and so on.

"Virtually every second of every day you rely on minerals that are obtained only two ways—through some form of mining or extraction and subsequent processing that relies on other minerals or through the recycling of materials initially manufactured from the former."

CONVENIENCE

Mind you, it's inconvenient to deliver clay tablets by hand over long distances, even if you have a super light titanium bike with minimum rolling resistance tires, which is why metals and petroleum derivatives are so pervasive in the human environment.

And while I'm an advocate of green transportation, bike riding in particular, which lowers the human carbon footprint, I don't buy into the sanctimonious righteousness that so often accompanies the decision. We're all in this, not just some of us.

The analysts who crunch these kinds of numbers calculate that manufacturing the average bicycle, using steel, special additives, plastics and rubber, results in the release of about 240 kilograms of greenhouse gases. Every bike manufactured uses about the same amount of energy and metals as a car door.

To recover the initial carbon footprint of your bike, you have to ride it at least 643 kilometres. Analysis comparing the carbon footprints of a family sedan and a bicycle conclude that assuming you cycle 12 kilometres a day for 15 years, the impact of the bike is one-tenth that of the car.

I relied on several sources for these insights, including one by a graduate student at Massachusetts Institute of Technology who is quoted in *The Guardian* newspaper; Mike Berner-Lee's fascinating book *How Bad are Bananas? The Carbon Footprint of Everything*; and *The Numbers Game: The Commonsense Guide to Understanding Numbers in the News, in Politics and in Life* by Michael Blastland which *The Economist* cited as a best book in 2007.

So, riding a bike to work instead of driving three tonnes of steel and plastic has enormous merit.

Biking reduces the carbon footprint of your daily commute, it helps eke out increasingly scarce and therefore increasingly expensive resources, it reduces the wear and tear on road surfaces and finally, it's good for your well-being—which is especially beneficial considering what would happen to our health care system were it to do without steel for gurneys, beds, operating room mirrors, sterilization units, wheelchairs, X-ray machines, scalpels and syringes, etc.

The truth is that even the highest virtue is dependent upon one of the industries that is increasingly popular for those who don't think too deeply to dismiss in knee-jerk reaction as dirty and unnecessary.

To make this observation is not to absolve the mining industry of its abysmal record of poor environmental stewardship or its historically cavalier response to those with the temerity to think it could and should do a lot better. Nor is it to belittle the goal of shrinking carbon footprints through conservation, recycling, repurposing or otherwise making our use of energy and materials cleaner and more efficient.

It is to say, get real folks. If you don't understand the importance of mining and mineral extraction to the way you live, it's going to be difficult to rationally effect the changes we can and must make to maximize benefits while minimizing consequences.

The fact is that without the metallurgical coal that's shipped from B.C. ports to distant steel mills; without the petroleum products derived from crude oil and natural gas; without the metals mined and refined here and elsewhere, the world we inhabit would be a much less pleasant place.

Virtually every second of every day you rely on minerals that are obtained only two ways—through some form of mining or extraction and subsequent processing that relies on other minerals or through the recycling of materials initially manufactured from the former.

Metals, petroleum derivatives and carbon-based energy sources are all so embedded in our global manufacturing, construction, transportation, monetary, communications and systems of distribution for food, health care, education, art and entertainment that effecting positive environmental change is complicated.

Let's consider entertainment. How about a DVD? Aluminum, gold, dyos, silver, nickel, poly-

carbonate petroleum derivatives and acrylic lacquer go into each disc, of which more than five million are discarded each year. Yet recycled, their components can be used again in auto parts, insulation, electronics, plastics, office equipment and even to make jewel cases for the next generation of discs.

Clearly, simply shutting down mines wherever there is an esthetic, social or environmental conflict is no more intelligent a response than simply permitting the industry to do whatever it deems necessary wherever it likes without reference to esthetic, social or environmental values.

Yet without mining, you could kiss your iPod goodbye. And forget your smartphone. No laptops, desktops, netbooks, tablets or the communications networks upon which they rely. Energy efficient lighting, solar panels, wind turbines, hydro-electricity turbines, pipelines that bring clean drinking water to vast cities—in themselves more energy and resources efficient because of their density—and pipelines that carry away human wastes for treatment and disposal, all rely on mining.

TRANSPORTATION

Without minerals and metals, air travel is no more. Maritime shipping is restricted to sailing ships which must navigate around Cape Horn—with all the perils that entails—as they did 150 years ago. Why Cape Horn? Because the Panama Canal requires mined materials to maintain its locks. Train travel is done, so to get from Vancouver to Toronto by land you are riding a horse (which means walking more than you ride) or travelling by birchbark canoe.

The implications of returning to a metals-free transportation system are mind-boggling. Should the United States revert to horses for transportation and food production, for example, you'd need at least the same ratio of animals to humans that existed in 1900.

So the equine population must increase from the present nine million horses or so to more than 100 million.

If the average weight of a horse is about 500 kilograms and a working horse requires three per cent of its body weight in feed, horses would consume 1.5 million tonnes of feed a day, or about 550 million tonnes a year, all of which would have to be diverted from the human food supply.

And the human food supply would be simultaneously diminished because production capacity decreases precipitously with the absence of farm machinery and fertilizers. Mind you, you probably wouldn't need the bike to commute to work anymore because most of us would be working the land to produce the food to feed ourselves and the horses.

AGRICULTURE

Just 200 years ago, 90 per cent of the North American workforce was employed in agriculture to feed a population of 7 million. Now it's less than one per cent of the workforce and it feeds almost 340 million.

A South Dakota wheat farmer in 1900 produced about 6.5 bushels of wheat an acre. Last year, the average winter wheat yield per acre there was 50 bushels. Those increases in yield are due to the mechanization of production, a direct impact of metals fabrication and petroleum-based energy and fertilizer inputs.

Today, Canada's agri-food sector contributes more than $140 billion to the national GDP. Were it to return to the agrarian practices of a century ago, based on human and animal labour, the consequences for most of us would be unimaginably catastrophic.

Does this mean we should abandon striving for more efficient, benign and sensitive approaches to agriculture, consuming foods closer to the source of production, for example, or defending arable land from destruction or removal from the food production inventory?

No.

It does mean that when we consider industries like mining, we should put aside both the romanticizing of mining enthusiasts and the cynicism of their critics and apply some sober second thought to just how much we rely on the minerals hewn from the earth and what we can reasonably do to mitigate the consequences of our own appetites. **c**

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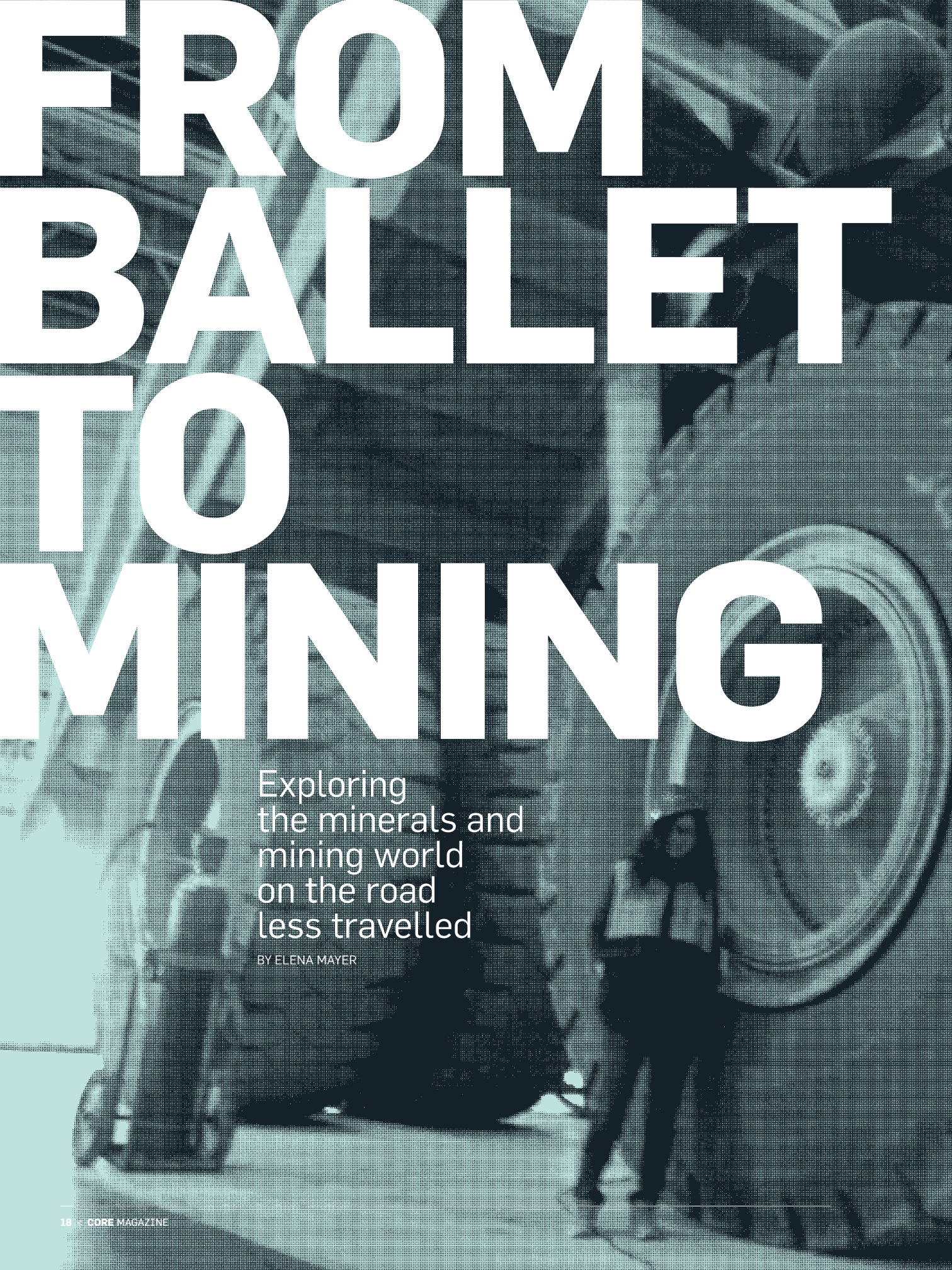
FROM BALLET TO MINING

Exploring the minerals and mining world on the road less travelled

BY ELENA MAYER



Like many girls growing up in the Soviet Union, I dreamt of becoming a professional ballerina. Then later in life, a high-profile lawyer. Mining was never in the picture. Yet as I grew up, a few inspirational mentors, the nuances of the industry, and my natural tendency to challenge stereotypes cultivated a strong a passion for mineral exploration and mining—so strong that I decided to pursue a career in the industry, against all odds.

Volunteering at a law firm at the age of 13 inspired me to become a lawyer, and 17 years later my aspiration was fully realized when I graduated with a dual American-Canadian law degree from the University of Windsor.

After graduation I was offered an articling position at one of the large law firms in downtown Toronto. My first exposure to mining came about as a result of being one of the few Spanish speaking juniors at the firm, where I was encouraged to participate in the firm's business development efforts in South America. Coincidentally, the Schulich School of Business at York University had just established the Global Mining Management (GMM) specialization—the first of its kind. Under the guidance of my mentors, and thanks to my mother's lifelong support, I decided to go back to school.

OFF TO ARGENTINA

As part of the International MBA at Schulich, I was required to complete an internship in South America. Determined to find one in mining, and interested in Argentina, I flew to Buenos Aires over Christmas break. Although I knocked on the doors of a number of Canadian mining companies after my arrival, it was actually a local lawyer, Ignacio Celorrio, who introduced me to the General Manager of the Mining Association of Argentina (CAEM), Damián Altgelt. That was a big break. Damián saw the value in my skills and offered me a summer position with CAEM.

Established in 1982, the CAEM represents the local mining industry and connects the private sector with people working in or affected by the industry, as well as politicians and NGOs. CAEM acts as a mediator, problem solver and communicator while offering a challenging and interesting working environment. Recognizing my desire to get as much first-hand knowledge and understanding of the Argentine mining sector as possible, the CAEM facilitated a number of interviews with representatives from mining companies, politicians, consultants, lawyers and other stakeholders. These meetings provided me with invaluable insight into the inner workings of the local mining industry, as well as Argentina's legal, political and economic frameworks. Last, but not least, I gained a unique perspective into how Canadian companies are perceived by the industry, the political and civil society establishments.

The trip to the GlencoreXstrata's Alumbrera mine in northern Argentina was one of the most exciting experiences of my life. The six-hour ride to the mine provided me with the opportunity to interact with the people who actually work at the mine site and who are directly affected by its operations. The miners shared their insights on the thorny subject of foreign companies operating on their country's territory, and the equitable division of benefits. Over the next couple of days, I lived the life of a miner.

The sheer size and smoothness of the operation was astonishing. I experienced first-hand how a copper mine works, the processes and transportation, the many responsibilities of each worker, and the strict enforcement of health and safety regulations. Visits to surrounding villages gave me an unmediated view of the CSR activities that brought tangible benefits to the community, such as a vineyard, manufacturing plant, hospitals and schools, along with the educational tools to operate this infrastructure once the company is gone. Seeing the way in which communities have benefitted from the company's CSR activities gave me a sense of purpose and further strengthened my commitment to the industry. This was perhaps the most fundamental lesson of my trip.

GLOBAL MINING MANAGEMENT PROGRAM

Today, I am currently in my last year of the MBA program. During the first year, I immersed myself in the mining industry: I became a student member of CIM, PDAC and the Canada Southern Africa Chamber of Business, joined professional groups like Women in Mining and Hispanics in Mining, and volunteered during the PDAC Convention. This year, I am even more involved. I collaborate with *Mining Press*, an Argentinean mining publication, helped organize the annual Schulich International Case Competition, which attracts industry professionals and MBA students from around the globe, and continue attending various mining industry-related networking and professional events. These extracurricular activities have strengthened my understanding of the mining industry and are helping me build a professional network. However, what makes me most confident about my ability to become an effective manager is the knowledge gained through the GMM program.

In parallel to the well-deserved media attention the program has received, I am fortunate to offer personal insight—free of marketing motives. One cannot imagine the GMM without the people who dedicate their time, attention and energy in making sure we maximize our experience. Richard Ross, the Director of the program, gives us practical knowledge and guidance, while Claudia Mueller, the Associate Director, complements Ross' knowledge with an academic angle while also offering a female perspective in our male-dominated class (four females, 34 males).

The learning curve is steep and the courses are demanding but very gratifying. My peers and I benefit from the years of experience and practical knowledge conveyed by guest speakers. Perhaps the most important aspect of the program is the broad exposure to all aspects of the industry—finance, operations, sustainability, strategy, valuations—that enables students to build a strong foundation.

GOING FORWARD

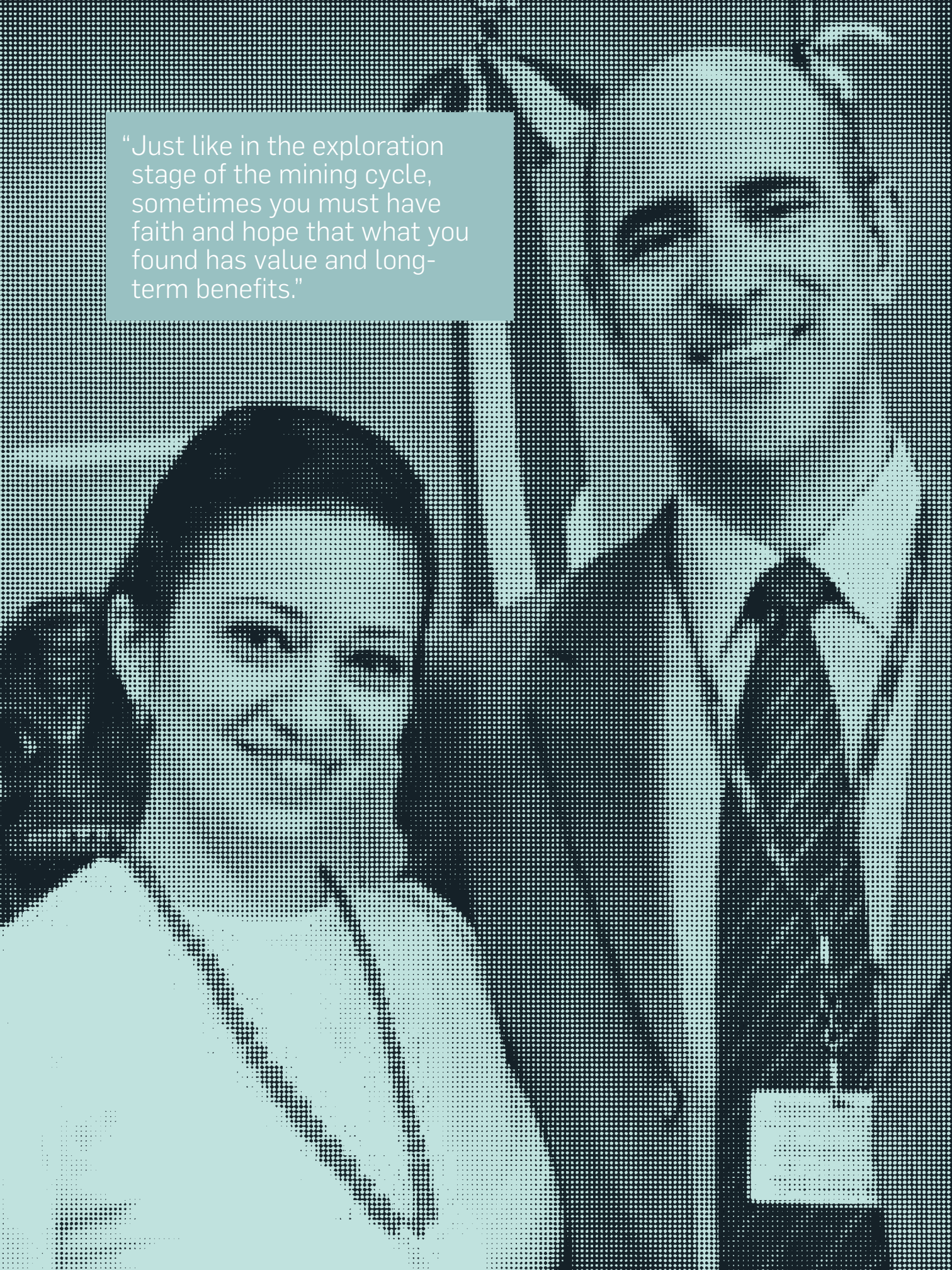
I am now just months away from graduating. Considering the down cycle, the fact that the GMM program is quite new and that the industry is yet to define its attitude towards MBA students, I am not quite sure where the road less travelled will take me. One thing I am sure of is that no matter how tough it gets out there, I believe the mining industry is where my career will flourish. With that belief in hand, I and my 37 colleagues in the GMM program will continue to invest time, money and effort in finding our place in the industry.

Just like in the exploration stage of the mining cycle, sometimes you must have faith and hope that what you found has value and long-term benefits. I have the same conviction about pursuing a career in mining. If asked to advise fellow students regarding a career path, I would recommend "exploring" a career in mining. In addition, in the past three years I have discovered that despite its international dimension, mining professionals are part of one big but small family always willing to listen, guide and help. Now, as the next generation of mining professionals, we aspire to learn from the mining community's experience, use our newly acquired skills and together continue building an industry that *creates value for all stakeholders in a responsible manner*. A cornerstone strategy definition taught in the GMM. c

TOP: GlencoreXstrata open pit copper mine in Catamarca, northern Argentina during the CAEM internship, June 2013.

BOTTOM: Elena Mayer and Schulich International Case Competition Executive Team. October 26, 2013. (Pramod Gopalakrishna, David Robson, Ran Maoz, Elena Mayer, Andrea Onley, Kaushik Gopalakrishnan and Sandesh Nayak)

OPPOSITE PAGE: Elena Mayer and Alejandro D'Agostino, Canada's Trade Commissioner to Argentina at the Mining Day celebration. Canadian Embassy in Buenos Aires, Argentina, May 2013.


“Just like in the exploration stage of the mining cycle, sometimes you must have faith and hope that what you found has value and long-term benefits.”

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